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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,766	11/25/2003	Marco Viti	856063.749	4188

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EXAMINER	
HORN, ROBERT WAYNE	

ART UNIT	PAPER NUMBER
2837	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H 19

Office Action Summary	Application No.	Applicant(s)	
	10/721,766	VITI, MARCO	
	Examiner	Art Unit	
	Robert W. Horn	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *3,5,8-12,15-21 and 24* is/are allowed.

6)☒ Claim(s) *1,2,4,6,7,13,14,22 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *April 26,2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 13, 14 and 22, 23 are rejected under 35 U.S.C. 102(b) as being patented by Young (U.S. Patent 5,506,487).

As regards claim 13, Young teaches a method for detecting the angular position of a brushless electric motor, of the type in which the emission of a polarity signal of the back electromotive force by a detection circuitry associated with the motor is provided, comprising:

detecting a polarity signal of a back electromotive force from a winding of the motor using a detection circuit; and

using a bi-directional counter.

Young discloses (column 8, beginning line 45) "a method that includes the steps of sensing a back EMF voltage in the windings and generating a signal, BEMF, representative of the sensed back EMF voltage. The BEMF signal has first and second polarities representative of position of the rotatable assembly relative to a zero crossing of the sensed back EMF voltage. The first polarity is representative of the position of the rotatable assembly past a position corresponding to the zero crossing and the second polarity is opposite the first polarity. ... The commutation counter increases its

count when the BEMF signal is of the first polarity and decreases its count when the BEMF signal is of the second polarity."

Claim 14 further comprises repeating determining and incrementing steps of claim 13. Young discloses the details of the BEMF counter (column 11, line 37): "Since the polarity of BEMF could actually be the result of electrical noise impressed on the back EMF voltage, (BEMF) counter 302 decreases its count when the signal polarity reverses, i.e., BEMF is low. Thus, the up/down BEMF count is repetitively counted partially up and then back down to zero before the true zero crossing. After the zero crossing, counter 302 accumulatively counts up to the preset value, even though occasional reverse counts are experienced along the way." Inherent in this method is the repeating of steps of determining and incrementing.

As regards claim 22, Young discloses a system, comprising:

a comparator module configured to detect a back electromotive force in a motor winding and supply a digital signal at an output based upon a polarity of the detected back electromotive force,

a counter module configured to increment up or down at a selected frequency according to a digital value at the output of the comparator module, and

an enable module configured to enable the counter module during a selected time period.

Young's reveals a comparator module (Figure 1, 158), reveals a counter module (Figure 3B, 302) configured to increment up or down at a selected frequency according to a digital value at the output of the counter module. The counter is described (column

3, line 16): the commutation counter increases its count when the BEMF signal is of the first polarity and decreases its count when the BEMF signal is of the second polarity. He describes the means for enabling/disabling counting in column 12, line 48.

As regards claim 23, as dependent on claim 22, Young discloses a position detection module to determine a true position of the rotor of the motor based up a count of the counter module at the end of the selected period of time. Young discloses the details of the BEMF counter (column 11, line 37): "Since the polarity of BEMF could actually be the result of electrical noise impressed on the back EMF voltage, (BEMF) counter 302 decreases its count when the signal polarity reverses, i.e., BEMF is low. Thus, the up/down BEMF count is repetitively counted partially up and then back down to zero before the true zero crossing. After the zero crossing, counter 302 accumulatively counts up to the preset value, even though occasional reverse counts are experienced along the way." Inherent in this method is the determination of the "true" zero crossing.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young (U.S. Patent 5,506,487) and further in view of Lee (U.S. Patent 5,469,112)

As regards claim 1, Young teaches a method for detecting the angular position of a brushless electric motor, of the type in which the emission of a polarity signal of the back electromotive force by a detection circuitry associated with the motor is provided, comprising:

detecting a polarity signal of a back electromotive force from a winding of the motor using a detection circuit; and

using a bi-directional counter.

Young teaches (column 8, beginning line 45) a method that includes the steps of sensing a back EMF voltage in the windings and generating a signal, BEMF, representative of the sensed back EMF voltage. The BEMF signal has first and second polarities representative of position of the rotatable assembly relative to a zero crossing of the sensed back EMF voltage. The first polarity is representative of the position of the rotatable assembly past a position corresponding to the zero crossing and the second polarity is opposite the first polarity. ... The commutation counter increases its count when the BEMF signal is of the first polarity and decreases its count when the BEMF signal is of the second polarity.

As regards claim 2, Young teaches the use of a digital up/down counter that is enabled around an expected zero-crossing of the back electromotive force with a counting window having an arbitrary duration. Young discloses the details of the BEMF counter (column 11, line 37): "Since the polarity of BEMF could actually be the result of electrical noise impressed on the back EMF voltage, (BEMF) counter 302 decreases its count when the signal polarity reverses, i.e., BEMF is low. Thus, the up/down BEMF

count is repetitively counted partially up and then back down to zero before the true zero crossing. After the zero crossing, counter 302 accumulatively counts up to the preset value, even though occasional reverse counts are experienced along the way." As such the duration of the counting window has an arbitrary window.

As regards claim 4, if the counting window has an arbitrary duration, it is the same as saying the counting window varies arbitrarily during the driving of the motor. Claim 4 is rejected on the same basis as claim 2.

As regards claim 6, which is dependent on claim 2, which is dependent on claim 1, Young teaches a counter (column 12, line 49) that is periodically disabled from counting.

As regards to claim 7, which is dependent on claim 1, Young teaches a counter wherein an increase in the counter takes place with the reception at the input of the counter of a logic state (one polarity, '1' or not '1'), whereas a decrease takes place together with a reception at the input of a logic state (other polarity, '0' or not '0').

As regards claims 1, 2, 4, 6, and 7 Young does not teach (from claim 1) using the bi-directional counter to count a difference in residence time of logic states '0' and '1' at an output of said detection circuitry.

Lee (Abstract and column 2, lines 40-49) teaches the use of a bidirectional counter to capture a difference between zero crossing events. Young uses the bi-directional counter to count down from a preset value and up to a terminal delay count and changing direction with the polarity signal. Although there is not an exact match in the methods of determining the correct position of the zero crossing of the back

electromotive force between the present application and Young, the means of using the bi-directional counter to detect a difference between polarity events is well known. The method of detecting angular position of Young combined with the method of using a bi-directional counter of Lee would comprise a method comparable to the one used in this application. It would have been obvious to one of ordinary skill in the art to use the up-down counter to count up then down at appropriate polarities than to use the counter to count down from a preset value and up to a delay count, as it is well known to use a counter to detect a difference between polarity events.

As regards claim 7, the choice of first polarity as logic '1' or logic '0' for determining the direction is a design choice that does not affect the nature of the operation of the circuit. It would have obvious to choose to one of ordinary skill in the art to choose one polarity for up and the other polarity for down. ~~In any case~~ because, Young teaches (column 12, line 37) ~~as quoted above teaches~~ reversing the counter when BEMF is low.

Allowable Subject Matter

Claims 3, 5, 8-12, 15-20, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Although other references in prior art disclose some or all the broader limitations cited in the base claims, the additional limitations described in the allowed dependent claims were found to provide novel methods for the detecting angular

position of a brushless motor, especially with respect to the method of using the up down counter. The detailed subject matter of claims 3, 5 and 8-12, especially concerning the bi-directional counter methods, was not found in prior. Claims 15-21, describe specific modifications to the method (found in base claims) of detecting rotor position, especially concerning the estimation of the zero crossing point and calculation methods, not found in prior art. The novel concept of claim 24 is the selecting of the time period of enabling the count such that the estimated point of zero crossing of the bemf at the midpoint of the time period of the count sequence.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. This is shown in the enclosed form 892.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert W. Horn whose telephone number is 571-272-8591. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David S. Martin can be reached on 571-272-2107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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4/20/05

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PRIMARY EXAMINER